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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
CHEN, TIANJIE

ART UNIT	PAPER NUMBER
2652	8

DATE MAILED: 07/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/944,075	FUKUZAWA ET AL.	
	Examiner	Art Unit	
	Tianjie Chen	2652	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 May 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) *15-18* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,10-14,19 and 20* is/are rejected.

7)☒ Claim(s) *8 and 9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Non-Final Rejection

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Election/Restrictions

2. Applicant's election with traverse of Species I, claims 1-14, 19 and 20 in Paper No. 7 filed 05/27/2003 is acknowledged. The traversal is on the ground(s) that "there is nothing mutually exclusive as between film structure illustrated in Figs. 16 and 17." This is not found persuasive because Figs. 16 and 17 correspond to two embodiments with currents going through mutually exclusive directions, which would be classified in deferent subclasses.

The requirement is still deemed proper and is therefore made FINAL.

Claim Objections

3. Claim 8 is objected to because of the following informalities:

In claim 8, line 4; "the second" should be changed to --a second--.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 11, 13, 14, 19, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by Gill (US 6,275,363).

With regard to claims 11, 19, and 20; Gill shows a magnetoresistance effect element in Fig. 12 including: a magnetization fixed layer having a ferromagnetic layer 226 having a magnetization direction 242 substantially fixed to one direction; a magnetization free layer 212 having a ferromagnetic layer having a magnetization direction varying in response to an external magnetic field; a non-magnetic intermediate layer 302 provided between the magnetization fixed layer and the magnetization free layer; a high conductive layer 304 having a higher conductivity than those of the magnetization fixed layer and the magnetization free layer, being stacked on one side of the magnetization free layer 212 remoter from the non-magnetic intermediate layer 302; and a non-magnetic crystalline layer 220 provided on one side of the high conductive layer 304 remoter from the magnetization free layer 212, and containing a compound of an element Al, which is different from the principal element Cu constituting the high conductive layer 304 as a principal component, the non-magnetic crystalline layer 220 having a substantially non-magnetism and being substantially crystalline.

Claim 19 further claims the oxide layer being formed by the irradiation with an ionized gas and stacked on the high conductive layer.

Claim 20 further claims the oxide layer being formed by the irradiation with a plasma gas and stacked on the high conductive layer.

A "product by process" claim is directed to the product per se, no matter how actually made, see In re Hirao, 190 USPQ 15 at 17 (footnote 3 CCPC, 5/27/76); In re Brown, 173 USPQ 685 (CCPA 5/18/72); In re Luck, 177 USPQ 523 (CCPA, 4/26/73);

In re Fessmann, 180 USPQ 324 (CCPA, 1/10/74); In re Thorpe, 227 USPQ 964 (CAFC, 11/21/85). The patentability of the final product in a "product by process" claim must be determined by the product itself and not the actual process and an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Claims 19 and 20 are product claims with process related features. The process related features obtain no weight in determining patentability.

With regard to claim 13, Gill further shows that the thickness of the non-magnetic crystalline layer 220 is 1 nm (Fig. 12), which is in the range of from 0.5 nm to 5 nm.

With regard to claim 14, Gill further shows the thickness of the high conductive layer 304 is 0.5 nm ()Fig. 12).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-7 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakakima et al (US 6,567,246).

With regard to claims 1 and 4; Sakakima et al shows a magnetoresistance effect element (Fig. 13) including: two ferromagnetic layers 3C and 5D, 3C being a magnetization fixed layer having a magnetization direction substantially fixed to one direction (Column 7, line 7), and 5D (Column 11, lines 41-42) being a magnetization

free layer having a magnetization direction varying in response to an external magnetic field; a non-magnetic layer 4 (Column 13, lines 41-42) provided between the ferromagnetic layers; and a layer 52 (Column 10, line 14) or 31 (Column 12, line 65 to column 13, line 4) containing an oxide or nitride (Column 19, line 46) as a principal component; the magnetoresistance effect element having a resistance varying in response to a relative angle between the magnetization direction of the magnetization fixed layer and the magnetization direction of the magnetization free layer.

Sakakima et al does not state that the oxide or nitride layer contains a magnetic transition metal element which does not bond to oxygen and nitrogen and which is at least one of Co, Fe and Ni.

However, Sakakima et al teaches "preferably, the above mentioned magnetic films contain Fe. For example, Fe-X (X is about 4 to 30% in atomic percentage); and X can be nitrogen N (Column 6, lines 1-6); also teaches that the oxide film 31 can be formed by oxidizing part of the metal magnetic film 32 (Column 12, lines 65-66).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to find that the oxide or nitride layer contains a magnetic transition metal element which does not bond to oxygen and nitrogen and which is at least one of Co, Fe and Ni. The rationale is as follows: Applicant has not disclose the atomic percentage of the magnetic transition metal element contained in the oxide or nitride layer; therefore, even a trace amount of the atom would meet the claim language set forth in this claim. Sakakima et al teaches that the percentage of the nitrogen can be as low as 4 %, it means there should be considerable amount of Fe, which does not bound to oxygen or nitrogen. Furthermore, as the oxide film is formed by oxidizing part of the metal magnetic film, there must be a transition region between

the oxidized layer and the non-oxidized layer. In this region the percentage of the oxygen will changes from the fully oxidized to zero; therefore, in this region oxide or nitride layer should contains a magnetic transition metal element which does not bond to oxygen and nitrogen and which is at least one of Co, Fe and Ni. One of ordinary skill in the art would have been motivated by Sakakima et al's teaching to find that the oxide or nitride layer contains a magnetic transition metal element which does not bond to oxygen and nitrogen and which is at least one of Co, Fe and Ni.

With regard to claim 2, Sakakima et al shows the layer containing the oxide as the principal component contains a magnetic transition metal element of Co, which does not bond to oxygen and nitrogen (Column 6, lines 14-17).

With regard to claim 3, Sakakima et al further shows the thickness of the layer containing the oxide or nitride as the principal component is 2 nm (Column 10, lines 24-25), which is in the range of from 1 nm to 3 nm.

With regard to claim 5, Sakakima et al further shows that the layer 31 containing the oxide or nitride as the principal component is provided between layers 32 constituting the magnetization fixed layer 3C.

With regard to claim 6, Sakakima et al further shows the layer constituting the magnetization fixed layer between the non-magnetic layer and the layer containing the oxide or nitride as the principal component is 1 nm (Column 24, lines 54-57),

With regard to claim 7, Sakakima et al further shows that the magnetization fixed layer 3C includes: a layer 32 (Above 33) having a magnetization direction substantially fixed to one direction; a second non-magnetic layer 33; and a third ferromagnetic layer 32 (below 33) antiferromagnetically bonding to the layer having the

magnetization direction substantially fixed to one direction, via the second non-magnetic layer 33.

With regard to claim 10, Sakakima et al does not explicitly show that the atomic composition of at least one of argon, xenon, helium, krypton and neon contained in the layer containing the oxide or nitride as the principal component is twice or more as much as the atomic composition of that in the layer which contacts the layer containing the oxide or nitride as the principal component.

However, it would have been obvious at the time the invention was made to one of ordinary skill in the art to recognize that the atomic composition of at least one of argon, xenon, helium, krypton and neon contained in the layer containing the oxide or nitride as the principal component is twice or more as much as the atomic composition of that in the layer which contacts the layer containing the oxide or nitride as the principal component. The rationale is as follows: Sakakima et al does not mention the layer which contacts the layer containing the oxide or nitride as the principal component containing any one from the group of argon, xenon, helium, krypton and neon; i.e. the atomic composition is zero. Twice of zero is zero. One of ordinary skill in the art would have recognized that the atomic composition of at least one of argon, xenon, helium, krypton and neon contained in the layer containing the oxide or nitride as the principal component is twice or more as much as the atomic composition of that in the layer which contacts the layer containing the oxide or nitride as the principal component.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gill in view of Sin et al (US 6,353,318).

With regard to claim12, Gill further shows the non-magnetic crystalline layer contains Al, but does not show it contains at least one selected from Si, Ge, W, Nb, Mo, P, V, Sb, Zr, Ti, Zn, Pb, Cr, Sn, Ga, Fe, Co and rare earth metals.

Sin et al shows a magnetoresistive sensor, wherein the SiO_2 and Al_2O_3 can be used as alternatives each other as a barrier layer (Column 5, lines 35-37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to include SiO_2 as an alternative for Al_2O_3 as taught by Sin et al. The rationale is as follows: using SiO_2 as an alternative for Al_2O_3 for barrier layer is notorious and commonly used in the art. Sin et al specifically teaches to use these two materials as alternatives. One of ordinary skill in the art would have been motivated to include SiO_2 as an alternative for Al_2O_3 thus improving the feasibility is fabrication.

Allowable Subject Matter

7. Claims 8 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With regard to claim 8, as the closest reference, Sakakima et al (US 6,567,246) shows a magnetoresistive element wherein the layer having the oxide or nitride as the principal component contacts an opposite surface of the magnetization free layer to a non-magnetic layer, but does not show the contact is via a second non-magnetic layer.

Applicant asserts that this second non-magnetic layer can reduce the magnetic field due to the current applied to the free layer (Specification, p. 34, lines 24-28).

Conclusion

8. The prior art made of record in PTO-892 Form and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tianjie Chen whose telephone number is (703) 305-7499. The examiner can normally be reached on 8:00-4:30, Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hoa Nguyen can be reached on (703) 305-9687. The fax phone numbers for the organization where this application or proceeding is assigned are (703)746-6037 for regular communications and (703) 872-9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 306-0377.

Tianjie Chen
Examiner
Art Unit 2652

July 8, 2003